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Observation of transient superconductivity at LaAlO₃/SrTiO₃ interface GOPI NATH DAPTARY, SHELENDER KUMAR, Indian Institute of Science, PRAMOD KUMAR, ANJANA DOGRA, National Physical Laboratory, DUSHYANT KUMAR, Indian Institute of Technology Kanpur, N. MOHANTA, University of Augsburg, A. TARAPHDER, Indian Institute of Technology Kharagpur, R. C. BUDHANI, National Physical Laboratory, AVEEK BID, Indian Institute of Science — We present observations of a novel magnetic field assisted transient superconducting state in the two-dimensional electron gas existing at the interface of LaAlO₃/SrTiO₃ heterostructure. The observed transient superconductivity appears upon the application of a time dependent magnetic field at a temperature significantly higher than the normal superconducting T_C reported previously in this material. This metastable state depends critically on the doping density in the parent compound. It appears concomitantly with a Lifshitz transition because of the interplay between ferromagnetism and superconductivity and the finite relaxation time of the in-plane magnetization. Superconductivity and magnetism are antagonistic to each other. Hence the observation of the co-existence of these two phases in the oxide heterostructures has thrown up many interesting and yet unanswered questions. Our results clearly demonstrate the inherently metastable nature of the superconducting state competing with a magnetic order in these systems. An open question in this field is the energetics of the interplay between these two competing orders and the present observation goes a long way in understanding the underlying mechanism.

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